IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

IN THE APPLICATION OF:

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DOCKET NO.: 3218R CUSTOMER NUMBER: 26645

SERIAL NO.: 10/621,154 EXAMINER: S. COSTALES

FILED: JULY 13, 2003 GROUP ART UNIT: 1764

TITLE: **Transmission Lubricating Compositions with Improved Performance, Containing Acid/Polyamine Condensation Product**

Wickliffe, Ohio

Hon. Commissioner for Patents
P. O. Box 1450
Alexandria, VA 22313-1450

Declaration Under Rule 132

Sir,

I, Suzanne Patterson, declare as follows:

I received a Bachelor of Science degree in 1997 from the University of Arkansas at Little Rock and both a Master of Science degree and Doctoral degree in the field of organic chemistry from The Ohio State University in 1999 and 2003, respectively.

I have been employed by The Lubrizol Corporation since 2003. From 2003 to 2007 I was responsible for the development of viscosity modifiers and friction modifiers while working in the research division. In 2007 I was promoted to Intellectual Property Technology Manager for the driveline group of Lubrizol (including automatic transmissions). I am presently responsible for coordinating the work associated with patents for lubricants for automatic transmissions, continuously variable transmissions, dual clutch transmissions, manual transmissions, and farm tractors as well as gear oils. As a result, I am familiar with the invention claimed in the above-mentioned case and with the references which were used in the rejection thereof.

In order to illustrate the advantages of the present invention, the following experiments were conducted at my direction.

Four transmission lubricants were prepared modelled on the formulation of Example 13 of the Ward reference, WO 00/70001. In an example of the present invention (designated "**Inventive Example 2**," a friction modifier is used which is the condensation product of a **fatty acid with an ethylenepolyamine** (in particular, isostearic acid + tetraethylenepentamine).

Also, three comparative formulations were prepared, identical except for the specific friction modifier. Comparative Example 1 used 1-hydroxyethyl-2-heptadecenyl imidazoline. This is a condensation product similar to that of the present invention, except that the amine component is not an ethylenepolyamine but rather N-hydroxyethyl ethylenediamine. This material is listed as a preferred material of Ward (page 19 line 30). In two other Comparative Examples, 3 and 4, formulations were prepared which contained the same amount of two other friction modifiers, respectively, disclosed by Ward. These other friction modifiers were glycerol monooleate (see page 18 line 17) and oleyl amide (page 18 line 16). The formulation details of these materials are shown in Table 1.

Formulation Components (by weight)	Comparative Ex 1	**Inventive Ex 2**	Comparative Ex 3	Comparative Ex 4
Oil of lubricating viscosity	85.30	85.30	85.30	85.30
Dispersant viscosity modifier, including 26.5% oil	7.50	7.50	7.50	7.50
Red dye	0.025	0.025	0.025	0.025
Borated amine dispersant, including 33% oil	3.50	3.50	3.50	3.50
Diluent oil	0.46	0.46	0.46	0.46
Dibutyl hydrogen phosphite	0.20	0.20	0.20	0.20
Phosphoric acid (85%)	0.04	0.04	0.04	0.04
Borated alpha olefin epoxide	0.20	0.20	0.20	0.20
Antioxidants	1.10	1.10	1.10	1.10
Alkyl hydrogen phosphite	0.10	0.10	0.10	0.10
Seal swell	0.60	0.60	0.60	0.60
Corrosion inhibitor	0.03	0.03	0.03	0.03
290 TBN Calcium sulfonate; including 41% oil	0.70	0.70	0.70	0.70
Borate ester	0.05	0.05	0.05	0.05
Foam inhibitors	0.042	0.042	0.042	0.042
1-Hydroxyethyl-2-heptadecenyl imidazoline	0.20			
Condensation product of fatty acid with polyamine		**0.20**		
Oleyl amide			0.20	
Glycerol monooleate				0.20
Analyticals				

BORON %	0.085	0.085	0.087	0.086
CALCIUM %	0.075	0.076	0.077	0.076
PHOSPHORUS %	0.043	0.044	0.044	0.044
SULFUR %	0.153	0.153	0.156	0.154
VISC @ 100°C cSt	6.798	6.729	6.734	6.724

Each of these formulations was tested using a Ford 20,000 Cycle Friction Durability Test. This test determines fluid frictional characteristics and friction durability over 20,000 clutch engagement cycles and reports dynamic and static torque measurements of the test fluid. The ratio of static torque (S1) over dynamic torque with respect to test cycles is reported and is an indication of anti-shudder durability. The results are shown in Fig. 1. The ratio of S1 to dynamic coefficient (generally taken at 1800 rpm) is reported in tabular form below as well as in the first attached graph, Fig. 1. The second attached graph shows the actual values of the static coefficient of friction.

Cycles	Comp Ex 1	**Inv. Ex 2**	Comp. Ex 3	Comp. Ex 4
25	0.889	1.052	1.08	1.042
100	0.824	0.965	1.035	1.028
200	0.815	0.944	1.035	1.029
400	0.798	0.93	1.022	1.022
600	0.798	0.951	1	1.014
800	0.798	0.943	0.985	0.993
1000	0.785	0.943	0.978	1.015
2000	0.808	0.978	0.956	1
4000	0.829	0.971	0.978	1.03
6000	0.824	0.95	1	1.06
8000	0.841	0.944	1.014	1.058
10000	0.842	0.944	1.007	1.05
12000	0.837	0.93	0.986	1.042
14000	0.867	0.924	0.986	1.028
16000	0.875	0.959	0.979	1.021
18000	0.883	0.959	0.966	1.007
20000	0.904	0.966	0.972	1.014

In the Friction Durability Test, it is desired that the ratio S1/D be between 0.9 and 1.0 throughout the 20,000 cycles of the test (after an initial break-in period). It is also desired that the static friction be high, in the range of about 0.12 and above.

Among the formulations tested, only the formulation containing the fatty acid/polyamine friction modifier showed acceptable performance. Its S1/D ratio remained in the range of 0.924 to 0.978 and the static coefficient remained between about 0.118 and 0.141. The closest other material, in terms of performance, was the oleyl amide of Comparative Example 3, and that

exhibited several measurements of S1/D in excess of 1.0, indicating that torque increases at the end of the clutch engagement which can potentially cause shudder. Comparative Example 3 also showed poor green (break in) friction performance (values in excess of 1.0 continuing through 400-600 cycles). The most similar material in terms of structure, the imidazoline of Comparative Example 1, performed very poorly, exhibiting both a very low S1/D and static coefficient of friction.

As a result, I conclude that, among the materials tested, only the fatty acid/amine condensate provided suitable coefficient of friction and antishudder performance at both beginning and end of test.

I further declare that all statements herein made of my own knowledge are true and all statements herein made on information and belief are believed to be true. I understand that wilful false statements and the like are punishable by fine or imprisonment or both (18 U.S.C. 1001) and may jeopardize the validity of the application or any patent issuing thereon.

Suzanne Patterson

Suzanne Patterson

3-24-08

Date

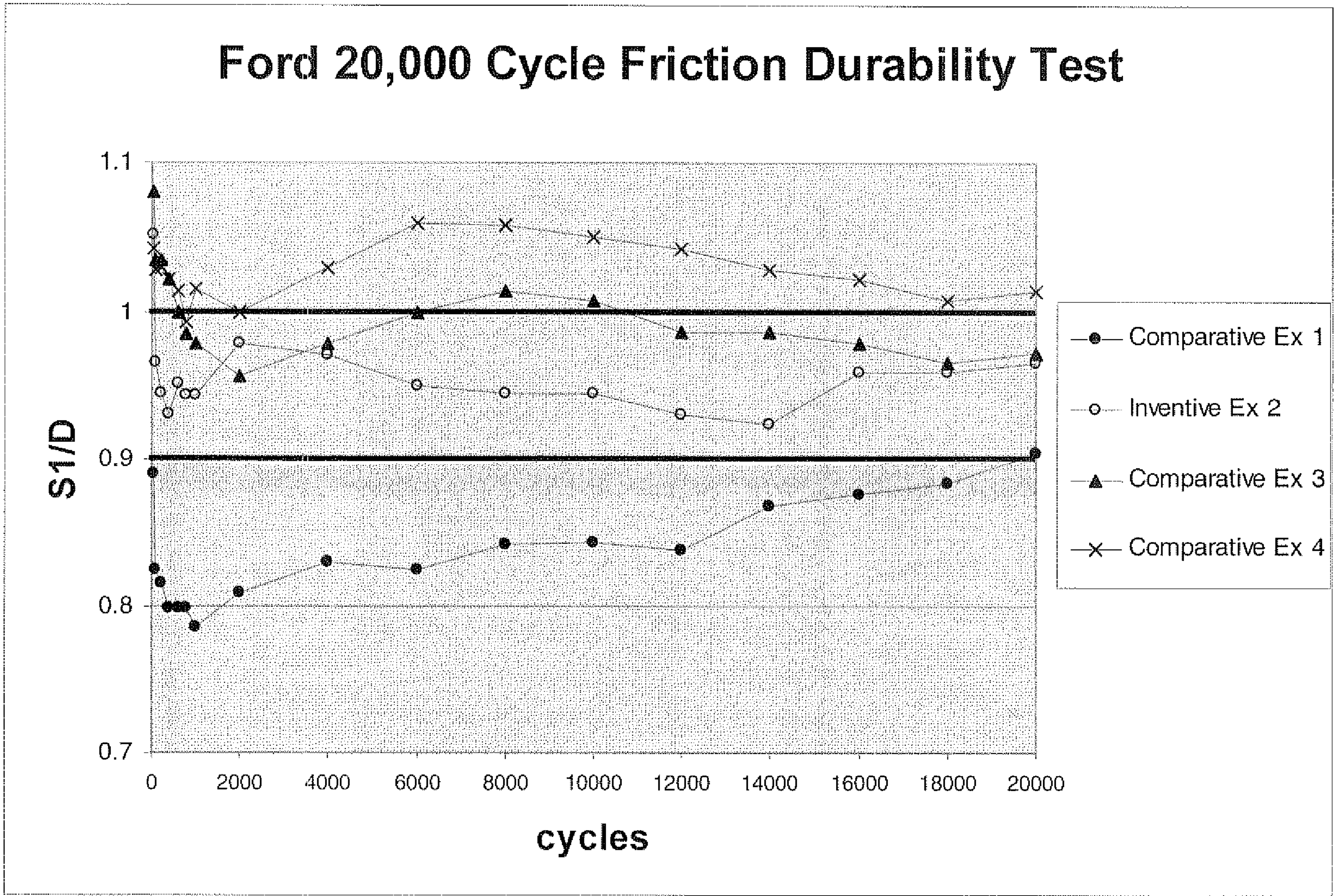
Ford 20,000 Cycle Friction Durability Test
1.1
1
0.9
0.8
0.7
S1/D
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000
cycles
Comparative Ex 1
Inventive Ex 2
Comparative Ex 3
Comparative Ex 4

Fig 1

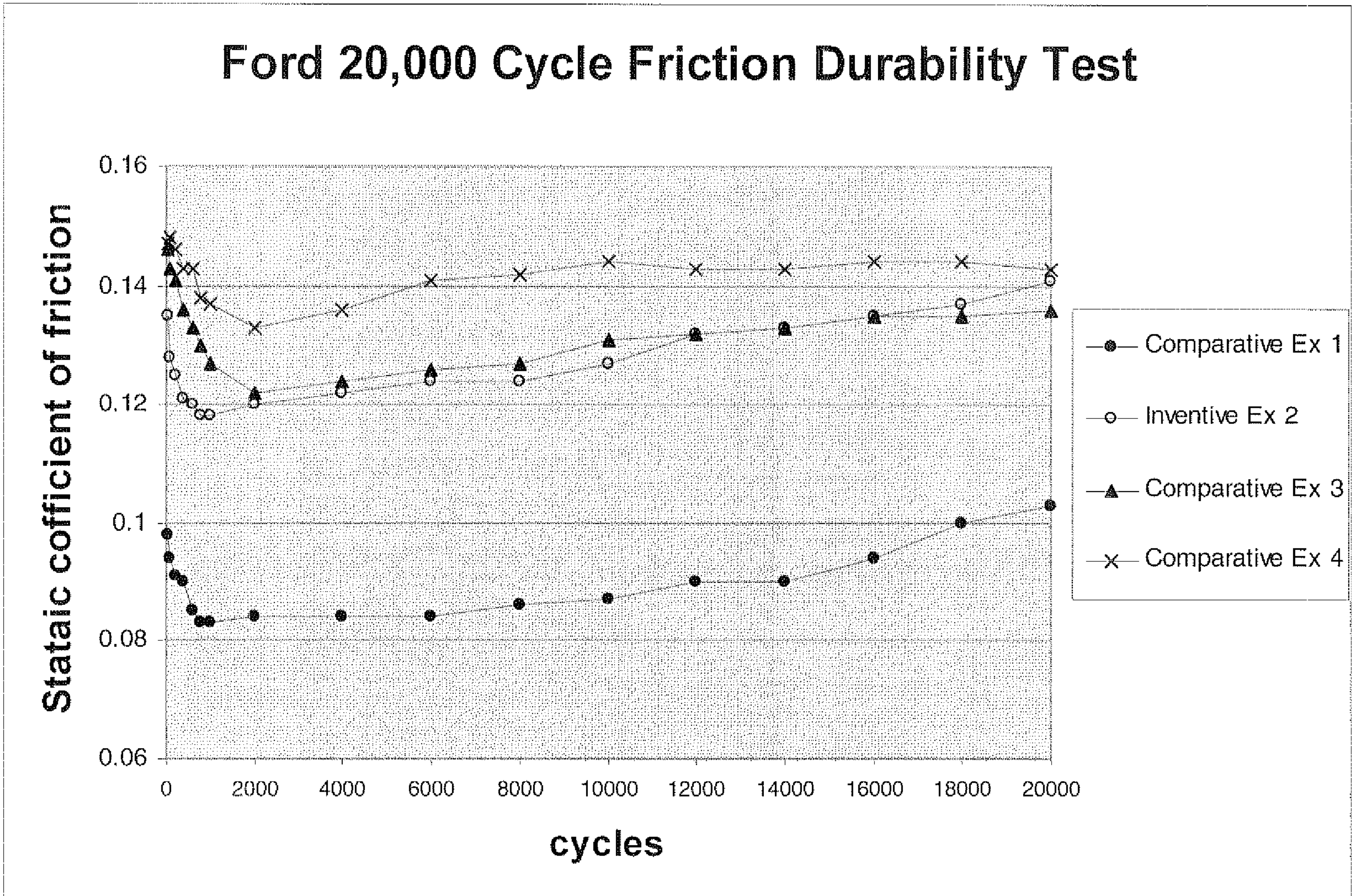
Ford 20,000 Cycle Friction Durability Test
Stataic cofficient of friction
0.16
0.14
0.12
0.1
0.08
0.06
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000
cycles
Comparative Ex 1
Inventive Ex 2
Comparative Ex 3
Comparative Ex 4

Fig 2.